2 of C

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No.: 6,700,240 B2

Issue Date: March 2, 2004

Inventor(s): Naotaka AKIWA

Title: STEPPING MOTOR, STEPPING MOTOR DEVICE AND DRIVING METHOD THEREOF

Docket No.: 111477

REQUEST FOR CERTIFICATE OF CORRECTION UNDER RULE 322

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

It is respectfully requested that a Certificate of Correction be issued in order to correct the errors specified in the attached copy of Certificate of Correction Form PTO-1050.

In particular, the Patent and Trademark Office failed to implement the Examiner's Amendment issued with the September 11, 2003 Notice of Allowance. In addition, minor informalities in the Examiner's Amendment are hereby corrected.

It is believed that the errors are on the part of the Patent and Trademark Office, and therefore no fee is due in relation to this matter in accordance with the provisions of 37 C.F.R. §1.322. However, should any fee be due, please charge the same against Deposit Account No. 15-0461 in order to ensure prompt issuance of a Certificate of Correction.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Jaquelin K. Spong
Registration No. 52,241

JAO:JKS/scg

Date: May 4, 2004

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

7 MAY 2004

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

PTO/SB/44 (02-01)
Approved for use through 1/31/2004. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO : 6,700,240 B2
DATED : March 2, 2004
INVENTOR(S) : Naotaka Akiwa

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claims 1, 4, 7, 8, 9, 10, 11 and 19 amended by Examiner's Amendment as follows:

1. A stepping motor comprising:

a permanent magnet type rotor with a plurality of poles secured to a rotating shaft and a stator having stator magnetic poles with stator magnetic pole teeth in which excitation windings are wound on a plurality of magnetic poles in a star or delta connection,

wherein the rotor is magnetized in different directions alternately circumferentially and a relationship between a predetermined number of the stator magnetic poles and a predetermined number of the rotor magnet poles is established in accordance to a following equation: $M = 4F / 3$ where M is the number of poles of the rotor and F is the number of the stator magnetic poles,

the rotor is cylindrical in shape with the stator disposed inside, disposed opposing the surfaces of the stator magnetic pole teeth through an air gap which is of a uniform dimension throughout the circumference between the surfaces of the stator magnetic pole teeth of the stator and the rotor, and

wherein the relationship of the predetermined numbers of stator poles and rotor poles enables surface magnetic flux distribution thereof having a substantially sinusoidal wave form circumferentially.

4. A stepping motor according to any one of claim 1, wherein an arc-shaped deformation preventing groove is provided along the circumference at the side end of a bearing holder contacting the base to which the stepping motor is mounted.

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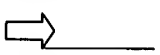

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INVENTOR(S) : Naotaka Akiwa

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

7. A stepping motor according to claim 5, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical bearing holder vertically mounted on the base to which the stepping motor is mounted, said polygon mirror rotates along with the rotating shaft and wherein the rotary polygon mirror is provided on the outer periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the rotor of the stepping motor.

8. A stepping motor device comprising:

a stepping motor including

a permanent magnet type rotor with a plurality of poles secured to a rotating shaft,

a stator having stator magnetic poles with stator magnetic pole teeth in which excitation windings are wound on a plurality of magnetic poles in a star or delta connection, and

a rotary polygon mirror provided on the outer periphery of a rotor yoke rotatable along with the rotating shaft with each mirror surface corresponding to a magnetic pole of the rotor,

wherein the rotor is magnetized in different directions alternately circumferentially and a relationship between a predetermined number of the stator magnetic poles and a predetermined number of the rotor magnet poles is established in accordance to a following equation: $M = 4F / 3$ where M is the number of poles of the rotor and F is the number of the stator magnetic poles,

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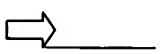

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

the rotor is cylindrical in shape with the stator disposed inside, disposed opposing the surfaces of the stator magnetic pole teeth through an air gap which is of a uniform dimension throughout the circumference between the surfaces of the stator magnetic pole teeth of the stator and the rotor, and

wherein said relationship of the predetermined numbers of stator poles and rotor poles enables surface magnetic flux distribution thereof having a substantially sinusoidal wave form circumferentially;

a leakage flux detector for detecting changes in magnetic poles provided on a cylindrical end surface of the rotor of the stepping motor;

a driving means to control rotation of the stepping motor by impressing a driving signal in a three-phase single-two-phase excitation mode to three excitation feeding terminals in a star or delta connection wound on a plurality of magnetic poles of the stepping motor; and

a means to detect the position of the rotary polygon mirror by a signal from the leakage flux detector.

9. A stepping motor device comprising:

a stepping motor including a permanent magnet type rotor with a plurality of poles secured to a rotating shaft, and

a stator having stator magnetic poles with stator magnetic pole teeth in which excitation windings are wound around a plurality of magnetic poles in a star or delta connection,

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wherein the rotor is magnetized in different directions alternately circumferentially and a relationship between a predetermined number of the stator magnetic poles and a predetermined number of the rotor magnet poles is established in accordance to a following equation: $M = 4F / 3$ where M is the number of poles of the rotor and F is the number of the stator magnetic poles,

the rotor is cylindrical in shape with the stator disposed inside, disposed opposing the surfaces of the stator magnetic pole teeth through an air gap which is of a uniform dimension throughout the circumference between the surfaces of the stator magnetic pole teeth of the stator and the rotor, and

wherein said relationship of the predetermined numbers of stator poles and rotor poles enables surface magnetic flux distribution thereof having a substantially sinusoidal wave form circumferentially;

a driving means to impress a driving signal in a three-phase single-two-phase excitation mode to three excitation feeding terminals and to control rotation of the stepping motor by a signal from a leakage flux detector for detecting magnetic flux leaking from a notch provided in a rotor yoke; and

a means to repeat the processing to control the rotation a predetermined number of times and to issue a warning when normal rotation is not obtained.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

10. A stepping motor according to any one of claim 2, wherein an arc-shaped deformation preventing groove is provided along the circumference at the side end of the bearing holder contacting the base to which the stepping motor is mounted.

11. A stepping motor according to any one of claim 3, wherein the arc-shaped deformation preventing groove is provided along the circumference at the side end of the bearing holder contacting the base to which the stepping motor is mounted.

19. A stepping motor according to claim 6, further comprising a rotary polygon mirror secured to the rotating shaft which is rotatably provided through the cylindrical bearing holder vertically mounted on the base to which the stepping motor is mounted, said polygon mirror rotates along with the rotating shaft and wherein the rotary polygon mirror is provided on the outer periphery of the rotor yoke with each mirror surface corresponding to a magnetic pole of the rotor of the stepping motor.

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